PERSONAL INFORMATION

First name **Anna**
Family name **Labernadie**
Open Researcher and Contributor ID (ORCID) 37061205000

Current position

Position	**Ramon y Cajal Principal Investigador**
Period	2022-Present
Institution	Centro Investigación Príncipe Felipe (CIPF)
Department/Center	Cell Behaviour and Tissue Bioengineering
Country	Spain
Keywords	Mechanobiology, Bioengineering, Cell Biology, Cancer, Immunology

Previous positions

Position	**Postdoctoral Researcher**
Period	2012-2022
Institution	Institute for Bioengineering of Catalonia (IBEC)
Department/Center	Integrative Cell and Tissues Dynamics (ICTD)
Country	Spain

Position	**Associate Professor**
Period	2018-2021 (part-time)
Institution	University of Barcelona
Department/Center	Biomedicine
Country	Spain

Position	**PhD Student**
Period	2008-2012
Institution	IPBS**,** CNRS UMR 5089, LAAS, CNRS UPR 8001/France
Department/Center	Activation and differentiation of phagocytes (IPBS), NanoBioSystems (LAAS)
Country	France

Education

PhD in Biology	University of Toulouse, France	2008-2012
Master of Analytical Sciences	University of Lyon, France	2006-2008
B.Sc. in Molecular Biology and Biochemistry	University of Toulouse, France	2003-2006

Languages: French: native speaker, English: fluent, TOEFL (2017) 95/120, Spanish: fluent.

CV SUMMARY

In 2012 I obtained a PhD in Cell Biology from Paul Sabatier University, Toulouse, France. **I perform my PhD training in Toulouse** between two laboratories, the Institute of Pharmacology and Structural Biology and the Laboratory for Analysis and Architecture of Systems (2008-2012). In this interdisciplinary environment at the interface between Immunology and Nanotechnologies, I developed multidisciplinary strategies, using Atomic Force Microscopy and microfabrication to study the mechanobiology of actin-based adhesive structure (podosome) in macrophages. This work revealed the dynamic mechanosensitive properties of this structure (Labernadie A. et al, *PNAS*, 2010). During this period, I also developed a technique called Protrusion Force Microscopy to observe and measure for the first time the protrusive force of podosomes on the substrate (Labernadie A. et al, *Nature Communications* 2014). **In 2012, I started my Post-doctoral research at IBEC, Barcelona, Spain.** Developing original multicellular culture combined with state-

of-the-art force probe techniques and high-resolution microscopy, we demonstrated the existence of force transmission between cancer-associated fibroblasts (CAFs) and cancer cells enabling cooperative tumour invasion (Labernadie A. et al, *Nature Cell Biology,* 2017). During this period, I had the opportunity to establish other collaborative work with the group of Dr Erik Sahai in the study of matrix organisation by fibroblasts (Park D. et al, *Nature Material*, 2019). **In 2018, I started independent research within the ICTD group at IBEC as a "La Caixa Junior Leader fellow" (2018-2021)**. Following my research interests in Cell Mechanics, I developed two main lines of investigation. One project entitled "*Tumour dissemination by cancer stem cells: a cell mechanics approach".* This work uses cutting-edge biophysical techniques and advanced molecular biology tools to investigate the role of cancer stem cells during collective cancer cell dissemination (*manuscript in revision, Nature Communications*, 2023). The second project entitled *"Immune and stromal landscape driving therapeutic response in cancer"* developed in collaboration with the Hospital del Mar Medical Research Institute, Barcelona (Dr A. Calon's group). This project aims at defining the stromal parameters explaining the immune exclusion associated with poor outcomes in cancer. Within the framework of this project, I developed an original cell culture platform (MIRO: Micro Immune Response On-chip) that enables the assessment of the role of the stroma in immunotherapy efficacy (*manuscript in revision, Nature Communications*, 2023). In 2022, we deposited a request for a European patent for our MIRO device in the category "Cell culture system and cell culture method" (Application number, EP22383158.7). During this period, I have also held an **Associate Professor position at the University of Barcelona (2018-2021),** giving practical courses in Biophysics in the Department of Biomedicine. **In 2022, I integrate the CIPF creating the Cell Behaviour and Tissue Bioengineering research group** thanks to the obtention of two Spanish national competitive grants, the "Ramon y Cajal fellowship" (5-year funding) and "Plan National" (3-year funding). My research focuses on uncovering the mechanism driving the spatial architecture of healthy and pathological tissues by developing multiscale cellular and tissue-like assays. To conduct those research I implemented a series of biophysical approaches and a microfabrication platform that enables the prototyping and fabrication of devices, to study cell-cell interactions and migration and high throughput multicellular structures production. **Over my career,** my research projects and collaborative work led to 11 scientific publications including in *Science, Nature material, Nature Cell Biology and Nature communications,* with 3 as a first author and 4 as a corresponding author (including manuscripts in revision), I obtained 9 competitive fellowships from European, National and private funding, including: Proyectos de Generación de Conocimiento (2021), Ramon y Cajal fellowship (2020), "La Caixa" Junior leader fellowship (2018), Ayudas Juan De La Cierva Incorporation (2016), Marie Skłodowska-Curie Actions fellowship (2014), EMBO fellowship (2013), participated in 12 national and international conferences including 8 talks as an invited speaker.

RELEVANT MERITS

Publications (* corresponding author)

Conti S., Venturini V., Xu C., Cañellas-Socias A., Rossetti L., Hui Li J., Cortina C., Roca-Cusachs P, Ruprecht V., Guck J., Diz-Muñoz A., Batlle E., **Labernadie A.*,** Trepat X.*, Membrane-to-cortex attachment determines different mechanical phenotypes in LGR5+ and LGR5- colorectal cancer cell. *Manuscript under revision, Nature Communications, 03/2023.*

Perucca A., Gómez Llonin A., Mañe Benach O., Hallopeau C., Isabel Rivas E., Linares Aceituno J., Garrido Saldaña M., Sallent Aragay A., Golde T., Colombelli J., Dalaka E., Linacero Blanco J., Cazorla M., Galan T., Pastor Viel J., Badenas X., Recort Bascuas A., Comerma Blesa L., Roca-Cusachs P., Albanell J., Trepat X.*, Calon A.* and **Labernadie A.*,** Micro Immune Response On-chip (MIRO): a model of tumour-stroma interface for immunotherapy testing. *Manuscript under revision, Nature Communications, 02/*2023.

González-Callejo P., Gener P., Díaz-Riascos V., Conti S., Cámara-Sánchez P., Riera R., Mancilla S., García-Gabilondo M., Peg V., Arango D., Rosell A., **Labernadie A.**, Trepat X., Albertazzi L., Schwartz Jr S., Seras-Franzoso J., Abasolo I. Extracellular vesicles secreted by triple-negative breast cancer stem cells trigger pre-metastatic niche remodelling and metastatic growth in the lungs. Int J Cancer, 152(10): 2153- 2165, 2023.

Rivas E.I., Linares J., Zwick M., Gomez-Llonin A., Guiu M., **Labernadie A.**, Badia-Ramentol J., Llado A., Bardia L., PerezNuñez I., Martinez-Ciarpaglini C., Tarazona N., Sallent-Aragay A., Garrido M., Celia-Terrassa A., Octavio Burgués O., Gomis R. R., Albanell J., Calon A. Targeted immunotherapy against distinct cancer-associated fibroblasts overcomes treatment resistance in refractory HER2+ breast tumours. *Nature Communications* 13, 5310, 2022.

Conti S., Kato T., Park D., Sahai E., Trepat X.*, **Labernadie A.*.** CAFs and cancer cells co-migration in 3D spheroid invasion assay. Epithelial-Mesenchymal Transition lab protocol series in *Methods in Molecular Biology*, 2179, pp. 243–256, ISBN: 978-1-0716-0779-4, Book Chapter, 2020.

Park D., Wershof E., Boeing S., **Labernadie A.**, Jenkins Robert P., George S., Trepat X., Bates P.A., Sahai E. (AC). Extracellular matrix anisotropy is determined by TFAP2C-dependent regulation of cell collisions. *Nature Materials,* 1476-4660, 2019.

Labernadie A. (AC), and Trepat X. (AC). Sticking, steering, squeezing, and shearing: cell movements driven by heterotypic mechanical forces. *Current opinion in cell biology*, 54,57-65, 2018.

Labernadie A., Kato T., Brugués A., Serra-Picamal X., et al. Sahai E., Trepat X. A mechanically active heterotypic E-cadherin/N-cadherin adhesion enables fibroblasts to drive cancer cell invasion. *Nature Cell Biology* 14, 224-237, 2017.

Sunyer R., Conte V., Escribano J., Elosegui-Artola A., **Labernadie A.**, Valon L., Navajas D., García-Aznar J. M., Muñoz J. J., Roca-Cusachs P., Trepat X. Collective cell durotaxis emerges from long-range intercellular force transmission, *Science* 353, (6304), 1157-1161, 2016.

Vizoso M., Puig M., Carmona F.J., et al., Alcaraz J. Aberrant DNA methylation in non-small cell lung cancer-associated fibroblasts. *Carcinogenesis;36(12):1453-63.* Author position: 7/18, 2015.

Labernadie A., Bouissou A., Delobelle P., Balor S., Voituriez R., Proag A., Fourquaux I., Thibault C., Vieu C., Poincloux R., M. Charrière G., Maridonneau-Parini I. Protrusion Force Microscopy reveals oscillatory force generation and mechanosensing activity of human macrophage podosomes, *Nature Communications* 5, 5343, 2014.

Labrousse A.M., Meunier E., Record J., **Labernadie A.**, Beduer A., Vieu C., Ben Safta T., and Maridonneau-Parini, I. Frustrated phagocytosis on micro-patterned immune complexes to characterize lysosome movements in live macrophages. *Frontiers in Immunology* 2, 51, 2011.

Labernadie A., Thibault C., Vieu C., Maridonneau-Parini I., and Charriere, G. M. Dynamics of podosome stiffness revealed by atomic force microscopy. *PNAS* 107, 21016-21021. 2010.

Research projects

- **Group leader Fellowship obtained by the applicant**

1. Funding body: **Plan Estatal de Investigación Científica, Técnica y de Innovación, ayudas 2021 «PROYECTOS DE GENERACIÓN DE CONOCIMIENTO» 2021-2023**. Institution: CIPF, Valencia, Spain. Reference: PID2021-125212OA-I00. Funding period: 2022-2025. Budget: 157300€.

2. Funding body: **Ayudas Ramon y Cajal fellowship**. Institution: CIPF, Valencia, Spain. Reference: RYC2020-029736-I. Funding period: 2022-2026. Budget: 208.600€.

3. Funding body: **LA CAIXA Junior Leader postdoctoral fellowship**. Institution: IBEC. Reference: LCF/BQ/PR18/11640001. Funding period: 10/04/2018-10/04/2021. Budget: 305700 €.

- **Post-doctoral fellowship obtained by the applicant:**

1. Funding body: **Ayudas Juan De La Cierva Incorporacion** 2014. Institution: IBEC. Reference: DC-MINECO, IJCI-2014-19843. Funding period: 10/01/2016-10/01/2018. Budget: 64000€.

2. Funding body: **Marie-Curie Intra-European Fellowship For Carrer Development**. Institution: IBEC. Reference: FP7-PEOPLE-2012-IEF. Funding period: 10/01/2014-10/01/2016. Budget: 166336.20€.

3. Funding body: **EMBO Long-Term Fellowship award**. Institution: IBEC. Reference: EMBO ALTF 1235-2012. Funding period 01/01/2013-31/12/2013. Budget: 32099 €.

- **Post-doctoral short visit grant**

Funding body: **ESF QUANTISSUE Short Visit Grant**. Institution: London Research Institute, Lincoln's Inn Fields Laboratories, Tumour cell biology group, Dr E. Sahai. Funding period: 15 days, September 2013. Budget: 1775 €.

- **PhD fellowships**

1. Funding bodies: **Ministerial Research allowance** (MESR, French Ministry of Higher Education and Research). Institutions: IPBS, CNRS UMR 5089, Toulouse, France. Funding Period: 2008-2011. Budget: 90 534 €.

2. Funding bodies: **Cancer Research Association** (ARC). Institutions : IPBS, CNRS UMR 5089, Toulouse, France. Period covered: 6 months, 2012. Budget: 10 109 €.

International and Spanish collaborations with Academic laboratories

1. *Immune and stromal landscape driving therapeutic response in cancer*. Collaborator: Dr Alexandre Calon Group. Hospital del Mar Medical Research Institute, Barcelona, Spain, 2018-present.

2. *Tumour dissemination by cancer stem cells: a cell mechanics approach*. Collaborator: Dr Eduard Batlle Group. IRB, Barcelona, Spain, 2017-present.

3. *Modelling the lymph node in 2D*. Collaborator: Dr Sophie Acton Group, Laboratory for Molecular Cell Biology- University College London, UK, 2017-2021.

4. *Physical forces driving fibroblast-led cancer cell migration*. Collaborator: Prof. Erik Sahai Group Francis Crick Institute, London, UK, 2012-present.

5. *Biophysical characterization of lung tumour-associated fibroblasts from adenocarcinoma and squamous cell carcinoma*. Collaborator: Dr Jordi Alcaraz Group, Hospital Clinic, Barcelona, Spain, 2012- present.

Contracts, technological, or transfer merits

Notification of Invention:

Cell culture system and cell culture method. Application number: EP22383158, 30/11/22. IBEC, Barcelona, Spain.

Collaboration with Industries

1. **Sequentia Biotech SL** (2017-2022): Immune and stromal landscape driving therapeutic response in cancer. Collaborators: Dr Alexandre Calon, Dr Anna Labernadie and Dr Riccardo Aiese Cigliano Riccardo AIESE CIGLIANO, Cofounder & Scientific Director of Sequentia.

2. **Biotech SL. Ferrer Advanced Biotherapeutics group and Mind the Byte** (2016-2018): Computational modelling of E-N-cadherins and design of possible inhibitors. Collaborators Prof. Xavier Trepat and Dr Anna Labernadie (IBEC), Dr Andrés Fernández García (Ferrer Advanced Biotherapeutics), Dr Alfons Nonell-Canals (Mind the Byte).

Scientific communications

International and National seminars as invited speaker: • Aix-Luminy Marseille University seminar, (invited by Dr Theodoly O.), Marseille, France, 2023 • CIPF seminar (invited by Dr Burk D.) Valencia, Spain, 2021 • IRB, C&DB Programme Seminar (invited by Dr Milan M.), Barcelona, Spain 2017• Hospital Universitari Vall d'HebronVall d'Hebron Institut de Recerca (VHIR) seminar, (invited by Dr Schwartz S.), Barcelona, Spain, 2017.

International and National conferences: Invited speaker: • Quantitative Analysis of Immune Cell Migration and Spatial Processes in Health and Disease, CMO Workshop, Oaxaca, Mexico, 2018 • II Congres de Biologia, Societat Catalana de Biologia, Barcelona, Spain, 2018 • Soft Matter Symposium, University of Florida, Gainesville, FL, USA, 2017 • 6th European Cell Mechanics Meeting, Barcelona, Spain, 2015. **Oral Presentations:** • Gordon Research Conference on Directed Cell Migration, Galveston, TX United States, 2017 • 8th IBEC symposium, Barcelona, Spain, 2015. **Posters:** • BIO-Europe Spring, Basel, Switzerland 2023 (attendees: IBEC TTOs) • EMBO ImmunoBiophysics, Les Houches, France, 2023 (attendee: Perucca A.) • Gordon Research Conference on Directed Cell Migration, Galveston, TX USA, 2017 • IRB Barcelona BioMed Conference, Barcelona, Spain, 2016. • 6th Biannual Congress: Integrated Mechano-chemical signals in invasion, Saint-Paul-de-Vence, France, 2015 • ASCB Annual Meeting, San Diego, CA USA, 2015 • Gordon

Research Conference on Directed Cell Migration, Galveston, TX USA, 2015. • Gordon Research Seminar on Directed Cell Migration, Galveston, TX USA, 2015.

Press release conference:

Presentation of the scientific work published in Nature Cell Biology in 2017. Attendees: Xavier Trepat, Anna Labernadie, Joseph Samitier, Jordi Portabella. Palau Macaya, Barcelona. 17/02/2017.

Awards:
1st Poster Prize awarded at the Conference meeting: Podosomes, Invadopodia and Focal Adhesions in Physiology and Pathology, September 18-21, 2011, Madrid. Prize: 600€.

Reviewer: Communications biology, 2018 (Nature publishing group).

Supervision:

• **B.Sc internship** in Biomedical Science, Julia Schneuling, 6 months of Erasmus training • **Laboratory technician,** Mari-Paz Rubio (2022-present) • **3 Master's Degree internships:** Clement Hallopeau 5 months internship, ENS de Lyon (January 2021-May 2021), Alice Perucca 10 months internship, Utrecht University, the Netherlands (March 2020-December 2020) and Guillem Singla Buxarrais, 7months internship, University of Barcelona, Spain, (February 2014-June 2014) • **Laboratory assistant,** Oriol Mañe Benach as a part-time contract for 2 years (2019-2021). • **Bachelor Degree's project,** Oriol Mañe Benach, 2021. • **PhD committee follow-up,** Ignasi Granero Moya's PhD thesis entitled "Study of the effects of mechanical force on nucleo-cytoplasmic transport" defended on the 12th of January 2023, Barcelona, Spain. • **co-director of a PhD student,** Sefora Conti, project entitled "Biophysical characterisation of tumour cell dissemination during the early metastatic processes", Universitat de Barcelona, Spain.

Evaluation panels: Member of 3 Doctoral Dissertations including 2 as a Committee Member: PhD defence of Valentine Seveau de Noray entitled " Quantitative study of cellular guidance in controlled microenvironment: Atipycal cases of rheotaxis and adhesive haptotaxis", defended on the 23dr of November 2023, Aix-Marseille University, France; PhD defence of Laura Sala Romanya entitled "Methyltransferase inhibitors interfere with Snail1 action on myofibroblast activity to prevent fibrosis and metastasis", Pompeu Fabra University, Barcelona, Spain, 20th of June 2018, and one as Secretary substitute: PhD defence of Anita Joanna Kosmalska, entitled "Physical principles of membrane remodelling during cell mechanoadaptation" held on the 6th of May 2016 in Barcelona, Spain and as **External examiner of M.Sc. dissertation** in Medical Cell Biology defended by Breffini Whitehead University of Capetown, SA, April 2017.

Employee:

Laboratory assistants: Oriol Mañe Benach, September 2019-July 2021. Alice Perruca, January-July 2021, Institute for Bioengineering of Catalonia (IBEC).

Teaching activities: Associate Professor, Department of Biomedicine, University of Barcelona. Practical Courses of Biophysics 1st year B.Sc Biomedicine, and 1st year of Medicine, 80h per year. 2018-present.